VEHICLE EMISSIONS INSPECTION AND MAINTENANCE (I/M) PROGRAM

ANNUAL REPORT FOR 1992-1995

October, 1996

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Protection

Division of Vehicles Inspections & Maintenance
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PREFACE

This is the 1992-1995 report for vehicle emissions inspection and maintenance (I/M) program issued by the Massachusetts Department of Environmental Protection. The report was prepared by the Automotive Testing and Technology Branch of the Enhanced Inspection and Maintenance Division. This report is directed toward both the technical audience and the interested general public. The branch solicits comments on this report and welcomes suggestions on our interpretations, conclusions, and the methods of presentation. Please forward any response to Bert Cox, Chief, or Soroosh Naderi, Project Manager, Automotive Testing and Technology Branch, Department of Environmental Protection, Bureau of Waste Prevention, Division of Enhanced I/M, 10th Floor One Winter Street Boston, MA 02108.

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MASSACHUSETTS VEHICLE EMISSIONS INSPECTION AND MAINTENANCE (I/M) PROGRAM ANNUAL REPORT FOR 1992-1995

I. INTRODUCTION

A. MASSACHUSETTS CURRENT I/M PROGRAM

Cars and trucks are the largest contributors to air pollution in the Commonwealth of Massachusetts. About 1/3 of ozone causing pollution comes from on road vehicles. Lack of maintenance and normal deterioration of the emission control system cause on road vehicles to produce more pollution as they get older.

Most of mobile source emissions are caused by a small percentage of the vehicles. According to the Illinois Department of Energy and Natural Resources and the California Air Resource Board, a compelling body of remote sensing and roadside data show that about 50% of the CO and HC emissions come from 10% of the vehicles. A relatively small amount of the overall emissions comes from the very old cars because they contribute such a small amount to the total vehicle miles traveled. One of the major causes of excess emissions from mobile sources is high-emitters vehicles that operate on the roads. The high-emitter problems span all model years and results from dirty vehicles that are driven significant distances. According to Dr. Lawson (J. Air&Waste Management, Assoc. 1995, Vol 45, p 465), the high emitter light duty vehicles can emit as much as , or more than, 113 grams of CO, 28 grams of HC, and 10 grams of NOx for each mile travelled. Inspection and maintenance (I/M) programs are designed to identify high emitters, require the repair of these vehicles and ensure that the emission control systems are functioning properly throughout the lifetime of the vehicle.

Since the 1980s, Massachusetts has been using a basic, idle test, I/M program to provide emission reductions from motor vehicles. This program, which began in 1983, requires that gasoline-powered vehicles are inspected annually and upon change of ownership at private garages that are licensed by the state's Registry of Motor Vehicles (RMV). The inspection consists of safety inspection of systems such as brakes and lights, a visual checks of catalytic converter, and fuel inlet restrictor and measurement of carbon monoxide (CO) and hydrocarbon (HC) emissions at idle. Carbon dioxide (CO_2) levels and engine revolutions per minute (RPM) are also checked

to determine whether there are any exhaust leaks, and to ensure that the vehicle is properly at idle.

High levels of CO or HC indicate that the engine is not operating properly. Before each emission test, the vehicle is required be driven for 20 minuets and the levels of CO and HC can not exceed the Massachusetts official emissions' standards:

VEHICLE MODEL YEAR	CARBON MONOXIDE (CO) (MAXIMUM % PER STANDARD VOLUME)	HYDROCARBONS (HC) (MAXIMUM PARTS PER MILLION, PPM)
1977-1979	4.0	400
1980	2.7	300
1981+	1.2	220

To perform a valid emission test, the engine must be operating in a stable idle mode. Excessively high or fluctuating RPM (Revolution Per Minute) indicates that the engine is not idling at the correct speed and the vehicle will fail for high RPM. The vehicle must also be emitting an undiluted sample of exhaust gases before a valid emission's test can be performed. Extremely low CO2 levels indicate that a leak in the exhaust system or the sample probe is not inserted properly is allowing outside air to enter and diluting the emissions sample:

NUMBER OF CYLINDERS	MAXIMUM VALID RPM	MINIMUM LEVEL OF CO2	
		WITH AIR PUMP	WITHOUT AIR PUMP
4 or less	1600	4%	6%
More than 4	1200	4%	6%

Evaluation of the current program, however, shows that the program is not achieving its intended effectiveness:

- Every summer in Massachusetts, ozone pollution exceeds the National Ambient Air Quality Standard (NAAQS).
- Of the two primary precursors of ozone (i.e., NOx or HC), the current emission's test identifies only a small portion of excess HC emissions.
- The current program also incapable of identifying No_x
- The current inspection does not test for fuel vapors that evaporate from a car at rest (a parked vehicle can produce significant evaporative emissions on hot days) nor does it test for smoke or other pollutants from diesels.

B. PURPOSE OF THE REPORT

This Report provides statistical and general operations information regarding the I/M Program for the 1992-1995 program years. Two key purposes for the production of this Report are for DEP to evaluate program effectiveness and to present an I/M Program status to the U.S. Environmental Protection Agency (EPA). Due to the former, the data contained herein meet or exceed the reporting requirements established by the EPA.

II. I/M PROGRAM OPERATIONS

The I/M program is jointly administered by the Department of Environmental Protection (DEP) and the Registry of Motor Vehicles (RMV). The RMV is primarily responsible for the administration and day-to-day operations such as the licensing, compliance, and enforcement activities at the inspection stations and on road enforcement. As I/M is a combiened safety and emissions inspections program, the RMV is also responsible for the vehicle safety program.

The DEP is responsible for the general oversight, management, administration of the compliance, quality control, and data management of the emission's portion of the inspection program. The following sections discuss I/M data from a technical operational perspective:

A. A summary of RMV information, compliance and enforcement activities at the licensed inspection stations.

B. DEP's emissions inspector certification program

C. Emissions Inspections Statistical data

D. Public outreach and public information statistics

E. Analyzer audit program data

F. Trend analysis of audits and reaudits for the 1992-1995 program years

A. COMPLIANCE AND ENFORCEMENT

Table II-A.1 presents a summary of the vehicle registrations, stickers and waivers for program years 1992-1995:

Table II-A.1: Program years 1992-1995 Registry information

Program year	No. of registered LDV	No. of valid stickers issued	No. of rejection stickers issued	Total waivers issued
1992	3,817,035	4,325,256	265,202	216
1993	3,894,825	4,118,839	456,000	207
1994	3,981,568	3,756,182	483,400	155
1995	4,092,220	3,741,747	455,800	89

Source: Massachusetts's RMV

The number of registered light duty vehicles (LDV) reflects the total number of passenger vehicles, light duty gasoline trucks (LDGT), and light duty diesel vehicles (LDDV). Any motor vehicle registered in Massachusetts must have a safety inspection. Vehicles exempt from the emission's portion of the inspection are those that are: more than 15 years old; have a maximum speed of 25 m.p.h. or less; motor cycles; use diesel fuel; have a gross vehicle weight rating in excess of 8,500 pounds; or are brand new vehicles being registered for the first time. To be considered "new" a vehicle must be of the current model year or year preceding and have less than 1000 odometer miles. The vehicle cannot have been previously owned or registered. All such, vehicles classified as new, are exempt from the emissions test for a period of one year only or until the vehicle is sold or the registration transferred.

The stickers are sold by RMV and used as certification of inspection. The number of issued valid inspection stickers is equal to the total number of valid sold stickers less rebates, destroyed, stolen, and damaged or lost stickers. Unused stickers are returned to RMV, and are not resold.

It is illegal for a dealer to sell a used vehicle with an affixed sticker. A dealer must remove a sticker previously affixed to the windshield of a used vehicle. The sticker is not transferable under the buyer's registration. Consumers should have a used vehicle tested within seven days of the date of sale. A vehicle with a transferred registration must undergo the safety and emissions test within seven days after the transfer occurs. If, however, new plates are purchased for the same vehicle under the same registration during a year it had previously undergone inspection, the sticker remains valid. It is recommended that any motor vehicle registered in Massachusetts that will not be in the state during its month of inspection, be inspected within 15 days upon return. No penalties will be assessed provided the vehicle bears a valid inspection sticker from another state obtained while out of state.

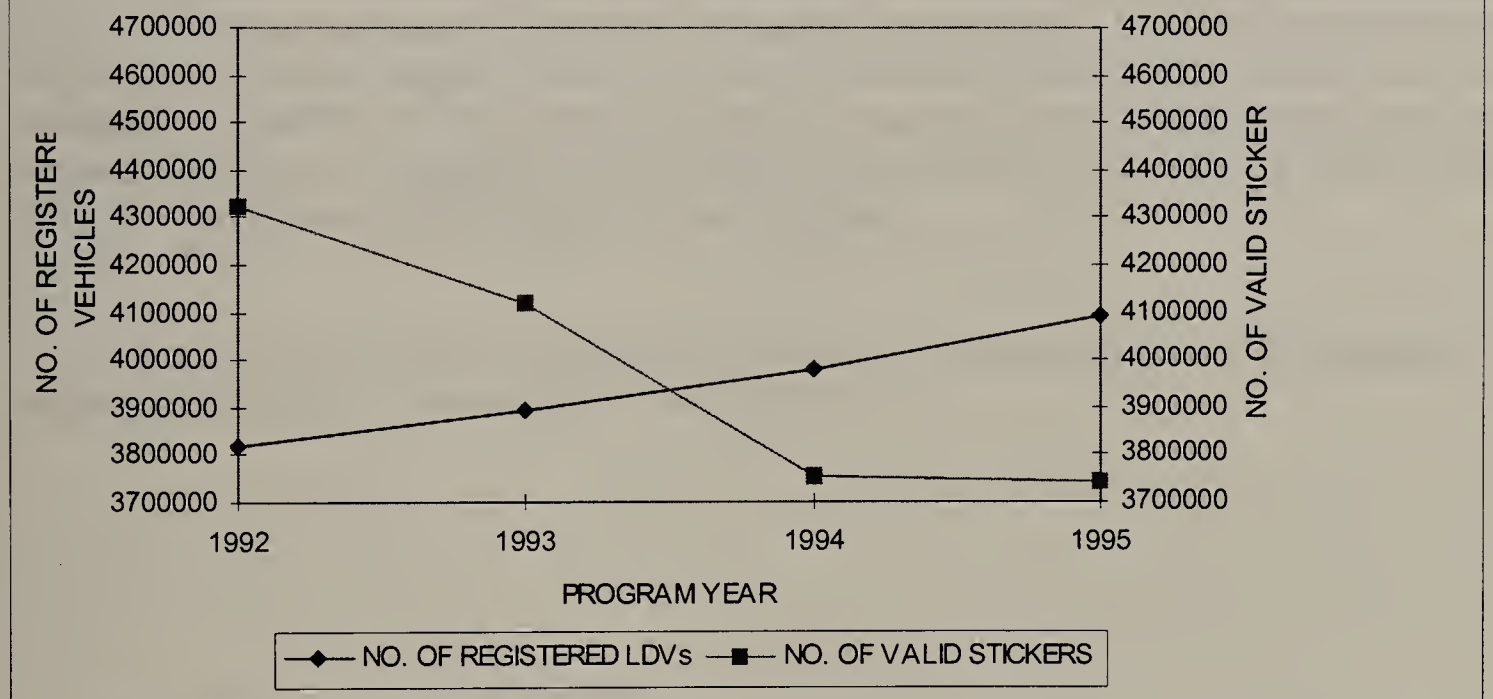
Not all the vehicles pass the inspections. If the vehicle fails the test, the inspector issues an I/M rejection sticker. The consumer has 20 calendar days after

emissions (not safety) test failure to make the necessary repairs. After these repairs have been completed, vehicle may be returned to the original inspection station to receive a free retest. The rejection stickers are not sold, but rather are given out by the RMV. If a vehicle should fail the retest, consumer may apply to the RMV for a Certificate of Waiver, which will be issued if:

1. The vehicle has had tune-up related repairs;
2. The vehicle's emission control devices are present and operating; and,
3. The cost of additional repairs exceeds $100 or 10% of the book value of the vehicle, whichever is less.

Figure II-A.1 shows four-year trends in number of registered vehicles and the number of valid stickers that issued by RMV for 1992 to 1995 period.

FIGURE II - A.1: FOUR-YEAR TRENDS IN NO. OF REGISTERED VEHICLES



The number of registered LDV increased by 2% from 1992 to 1993, 2.2% from 1993 to 1994 and 2.8% from 1994 to 1995. From 1992 to 1995 the number of registered vehicles increased steadily. Trend in the number of stickers (valid or rejection) does not follow the same pattern as the number of registered vehicle does. In 1993, RMV issued 4.8% less stickers than 1992. The number of issued stickers dropped by 8.8% from 1993 to 1994 and by only 0.4% from 1994 to 1995. These trends suggest diminishing compliance.

Normally, for each year, the RMV issues more stickers than the number of registered LDVs. Stickers are issued for all registered vehicles not just LDVs for both the safety and emission tests (any motor vehicle registered in Massachusetts must

have a safety inspection). In 1992 this number was 13.3% more than the number of registered LDV, and in 1993 the number of issued stickers was 5.75% more than the number of registered LDV. In 1994 and 1995 the numbers of registered LDV apparently exceed the number of issued stickers. This might be due to data mistakes and the negligence of the motorist to get inspection stickers. There is also a population of vehicles that may have, in fact, failed inspection and never received a retest. These vehicles may, in the interim, have been in an accident, junked, stolen, put into storage, or moved to another state. It is also possible the owner of the failed vehicle may have secured a sticker through other means. From 1992 to 1993, the number of rejection stickers issued by RMV increased by 72 percent. It was for the first time in 1992, that data was collected for th the number of rejection stickers. It is not known that data are for full or partial year. The number of rejection stickers, increased by 6% from 1993 to 1994 and then decreased by 5.7% from 1994 to 1995. From 3/92-12/1992 total of 3573 overt and covert audits or visits were conducted. As a result, in 1992-1993 the number of rejections increased by 72%. Except for 1993, no audits were conducted in 1992 through 1995 and as a result the number of rejections decreased dramatically.

Sticker surveys are conducted across the Commonwealth and are important to ensure motorist compliance with the inspection regulations. Vehicles not displaying the required sticker are issued a RMV Courtesy Reminder Card (CRC). There is no data available at the RMV that tracks the number of surveyed group and the number of CRC issued to this group. Available data indicates that, sticker surveys were conducted, only in 1992, and totals of 4679 citations were issued.

A summary of RMV compliance and enforcement activities at the licensed inspection stations is presented in Table II-A.2.

Table II-A.2: Summary of station compliance activities

Program year	No. licensed Inspection stations	No. of warnings issued	No. of hearing conducted	No. of revocation	No. of suspensions issued	Conviction rate (%)	Average period of suspension	Routine station visits
1992	2858	20	304	0	232	76%	30 days	3573**
1993	N/A	68	278	0	117	42%	14-30 days	N/A
1994	N/A	101	141	1	139	98%	14-30 days	N/A
1995	2617*	285	305	2	120	39%	14-30 days	N/A

Source: Massachusetts's RMV

* As of 3/8/96, ** This figure reflects visits from 3/92-12/92

There are 4 classes of stations. A, B, C, and D. Class A stations are public inspection stations for safety and emissions' inspections. Stations with a class B license, conduct fleet inspections for safety and emissions. Class C stations are fleet inspection stations for safety inspections only. Those public inspection stations that perform safety only inspections hold a class D license.

PROGRAM YEAR	No. LICENSED INSPECTION STATIONS				
	CLASS A	CLASS B	TOTAL A+B	CLASS C	CLASS D
1992	2249	121	2370	361	127
1993	N/A	N/A	N/A	N/A	N/A
1994	N/A	N/A	N/A	N/A	N/A
1995	2049	105	2154	342	121

The RMV utilizes four state vehicles for covert inspections and other compliance activities. Two of these vehicles have been tampered with purposely (with EPA's approval) and are used to monitor the completeness and overall performance of the emission's inspection. RMV inspectors' personal vehicles are also used for covert inspections. All covert inspections are based on probable cause using documentation such as DEP enforcement reports, motorist complaints, higher than expected sticker sales, and RMV Inspectors' documented observations. Inspection station administrative audits are also conducted on a rotating schedule, in accordance with the provisions of 540 CMR 4.08. Any irregularities observed or found by the RMV inspector relative to inspections, audits, or paperwork are recorded, along with a compliance response appropriate to the severity of the infraction.

RMV conducted 3573 overt and covert audits for 3/92-12/1992. There are no available data from the RMV that tracks the number of covert or overt audits in 1993 through 1995. It is assumed that no audits were conducted by RMV in this period. In 1993 only, the DEP Strike Force investigators, conducted 135 cover stations' visits.

B. DEPARTMENT CERTIFICATION PROGRAM

The DEP has established a certification program for individuals who wish to become inspectors to conduct emissions testing. Such certification involves training by each supplier and is based upon a proficiency determination on the use of the equipment. Once trained by the supplier, an inspector must complete and submit a Certification Form to the DEP. Upon review of the information contained on the form, the DEP issues the certification directly to the inspector. Table II-B.1 shows the total number of inspectors.

Table II-B.1: Breakdown of inspector certifications and recertifications

Program year (1/1-12/31)	Total No. of certified inspectors	No. Of new certified inspectors
1992	13,902	2263
1993	15,974	2,072
1994	17,871	1,897
1995	19,754	1,883

In the above table, the total number of certified inspectors for each year, reflect both the numbers of existing inspectors in that year and the number of newly certified inspectors. It does not take into account the number of inspectors that no longer perform inspections (inspectors do not perform inspections because they moved out of state, or have changed their line of work).

Over the past six years, the DEP has established a certification program for inspectors to conduct emissions testing. Such certification involves training by each supplier and is based upon a proficiency determination on the use of the equipment. Once trained by the supplier, an inspector must complete and submit a Massachusetts Emissions Inspector Certification Form to DEP. Upon review of the information contained on the form, DEP issues the certification directly to the inspector. A database was created to track these certifications. Certifications are issued to the individuals when they are new hire or new to a licensed station. These individuals may have been certified on another manufacturer's analyzer and now have to be trained on a different analyzer. Individuals may have not performed inspections for some time and have forgotten their certification number. In any case, DEP is issuing a new certification to these individuals without removing the old certification number from the database. Therefor the number of certified inspectors in Table II-B.1 has a steady state increasing trend. For each year, the numbers of certified inspectors reflect the number of inspectors from the previous year plus the number of new certified inspectors.

The current database at the DEP is not capable of tracking the multiple certifications or the number of inspectors that no longer perform inspections and the number of inspectors.

In the new I/M program, all emissions' inspectors will receive formal training and will be certified to perform enhanced emissions' inspections. A contractor will develop, implement, and maintain an inspector training program as part of its training plan. An emission's inspector will be certified to perform emissions' inspections in accordance with the provisions of 310 CMR 60.02. To become a certified inspector, a candidate will successfully complete all DEP-approved training requirements. Prospective inspectors will be subjected to a written examination at the conclusion of each training. As a pre-requisite to re-certification the Contractor will provide refresher training and examination to each certified emissions inspector at least once every twenty-four months. An emissions inspector certification will be valid for no more than 24 months. A training and certification schedule will be developed to avoid lapses in inspector certification. The Contractor will provide a tracking system for inspector training and examination. The

database which are used for the purpose of curriculum evaluation, affirmative action compliance, and pass/fail trend analysis, and report such information to DEP on a periodic schedule. All such information, including the results of all tests, examinations, or training exercises will be made part of the personnel record of prospective or current employees and will be acceptable by DEP.

The Contractor will provide additional training, classroom, and field examinations prior to certification renewal. DEP will require additional training and examinations, as appropriate, prior to the expiration of a certified emissions inspector's current certification, as a result of equipment technical requirements, inspection procedures, or related changes. The program will include the quality control audit procedures that ensures the integrity of inspections and inspection data. The program will include a penalty schedule for stations whose inspector's continually and knowingly violate testing procedures.

The new database will be generated, describe the number of licensed inspection stations, number of inspectors, number of newly certified inspectors, recertified inspectors, and total number of certifications issued on a yearly basis. This database provide trends relative to number of inspectors which in turn can help target enforcement activities. The database will be used to provide quality assurance and quality control (QA/QC) audit procedure, emissions reductions estimates and determine program effectiveness.

C. INSPECTION DATA

This portion of the report presents data primarily contained in the DEP's I/M database for the period January 1 through December 31, 1992-1995. Emissions and safety inspection data for each vehicle performed with an approved emission's analyzer at an inspection station. Data are recorded onto a cassette tape that is housed within each analyzer. Routine collection of these data and submittal to the DEP is required from each of the three emission's analyzer suppliers:

- Automotive Diagnostics (i.e., Allen Test-Products Division, and Bear Automotive Service Equipment)
- Environmental Systems Products, ESP (i.e., Hamilton)
- Sun Electric Corporation (i.e., Snap-On & Sun Equipment Service).

During prescribed, routine monthly preventive maintenance (PM) visits to each station, the supplier's service technician removes the data cassette from each machine and replaces it with a blank cassette. The collected cassettes are then transferred onto a 9-track master tape at the supplier's facility. Master tapes are then sent to the DEP for further processing and analysis no later than 45 days after the close of the month. Table II-C displays the type of data recorded onto the cassettes and the format in which it is submitted to the DEP for analysis.

Once received by the DEP, each tape is processed automatically and consolidated into the I/M database (transaction file). The I/M transaction file is one of the largest databases in the DEP. Approximately 3.5 million inspection records can be expected annually. The records are processed using the State College Regency Computer Network (RCN). The DEP has maintained a contract with RCN annually for computer support throughout the fiscal year for anticipated demand for I/M data requests. A number of quality assurance (QA) checks and queries are made, and reports are run on these data on a monthly, quarterly, and yearly basis. To perform these functions, the DEP spends approximately $5100 each year in computer time.

Once all data tape submittals are reviewed, they are consolidated, by month and by quarter.

Table II-C: Format for individual inspection transaction records

FIELD	LENGTH	COLUMN
STATION NUMBER	7	1-7
DATE (MMDDYY)	6	8-13
INSPECTOR NUMBER	5	14-18
TYPE OF TEST	1	19
I FOR INITIAL		
R FOR RETEST		
C FOR CHALLENGE		
VEHICLE MAKE	5	20-24
VEHICLE YEAR	2	25-26
ODOMETER (THOUSANDS)	4	27-30
PLATE NUMBER	8	31-38
FUEL TYPE	1	39
G FOR GAS		
D FOR DIESEL		
VEHICLE TYPE	1	40
A FOR PASSENGER AUTO		
B LIGHT DUTY TRUCK		
C FOR MOTORCYCLE		
D FOR HEAVY DUTY TRUCK		
E FOR EXEMPT		
AIR PUMP	1	41
Y FOR YES		
N FOR NO		
HC RPM	4	42-45

CO% X 100	4	46-49
CO2 X 100	4	50-53
STICKER NUMBER	8	54-61
THE FOLLOWING 16 PASS/FAIL BYTES ARE CODE		
0 FOR PASS		
1 FOR FAIL		
CO2%	1	62
CO%	1	63
HC	1	64
FUEL FILLER NECK	1	65
CATALYTIC CONVERTER	1	66
OTHER	1	67
BUMPER/FENDERS	1	68
NUMBER/PLATES	1	69
WINDOW/WIPERS	1	70
HORN	1	71
STEERING SYSTEM	1	72
MUFFLER EXHAUST	1	73
TURN SIGNALS	1	74
HEAD LIGHTS	1	75
BREAKS	1	76
RPM	1	77

The aggregated I/M transaction file contains upwards of 3.3 million records for each year. Not all the records are applicable for the analyses called for in this report. A selection criterion is developed to cull the applicable records out of the transaction file. The selection criterion is based upon a number of factors including:

- Performance of the analyzers (i.e. the manner in which each analyzer records data onto the cassette

- Inspection procedure (e.g., what data are input manually during inspection by the certified inspector)

- General inspection requirements (e.g., which vehicles are exempt from combined safety and emissions inspection and only require a safety inspection, emissions Cutpoint categories, etc.)

Once the selection criteria are established, over 20 separate output files are set up to handle the data as they are selected, sorted, and counted. After sorting and counting, the retest data are then processed through a computer program. The program matches records by license number to the file that comprises all initial failures for each calendar year. This is to ascertain the number of vehicles that initially failed the emission's inspection and passed a subsequent retest (retest passes). Initial failures that were not matched to a retest in the initial month are saved to compare with retest passes in subsequent months. However, retest passes not matched to an initial test are not counted.

Table II-C.1 presents a breakdown of the inspection transactions that contained in the transaction file by inspection type. Each transaction file includes:

- Initial emissions inspections tests
- Exempts vehicles
- Number of retests

Table II-C.1: Breakdown of the inspection transactions

PROGRAM YEAR	TRANSACTION FILE (100%)	INITIAL RECORDED INSPECTIONS (%)	EXEMPTS (%)	RETEST (%)
1992	3,710,092	74.3	17.2	8.5
1993	3,589,972	74.5	18.7	6.8
1994	3,273,055	74.0	20.1	5.9
1995	3,205,497	73.1	21.5	5.4

Any motor vehicle registered in Massachusetts must have a safety inspection. Vehicles exempt from the emissions portion of the inspection are those which:

1. Are more than 15 years old
2. Have a maximum speed of 25mph or less
3. Are motorcycles
4. Have a diesel engine
5. Have a gross vehicle weight rating (GVWR) in excess of 8,500 ponds or more
6. Is brand new vehicles being registered for the first time (brand new vehicles are exempt for one year)

Table II-C.2 shows the breakdown of total exempted vehicles in terms of fuel and vehicle types for program years 1992 to 1995.

Table II-C.2: breakdown of total exempted vehicles

PROGRAM YEAR	TOTAL NUMBER OF EXEMPT VEHICLES	EXEMPT GASOLINE (%)	EXEMPT DIESEL (%)	EXEMPT OTHER (%)*	TOTAL EXEMPT (%)	MINIMUM MODEL YEAR FOR EXEMPTION
1992	640,476	7.5	1.3	8.5	17.2	1977 OR LESS
1993	671,099	9.8	1.5	7.4	18.7	1978 OR LESS
1994	656,814	10.7	1.5	7.9	20.1	1979 OR LESS
1995	690,547	11.6	1.6	8.3	21.5	1980 OR LESS

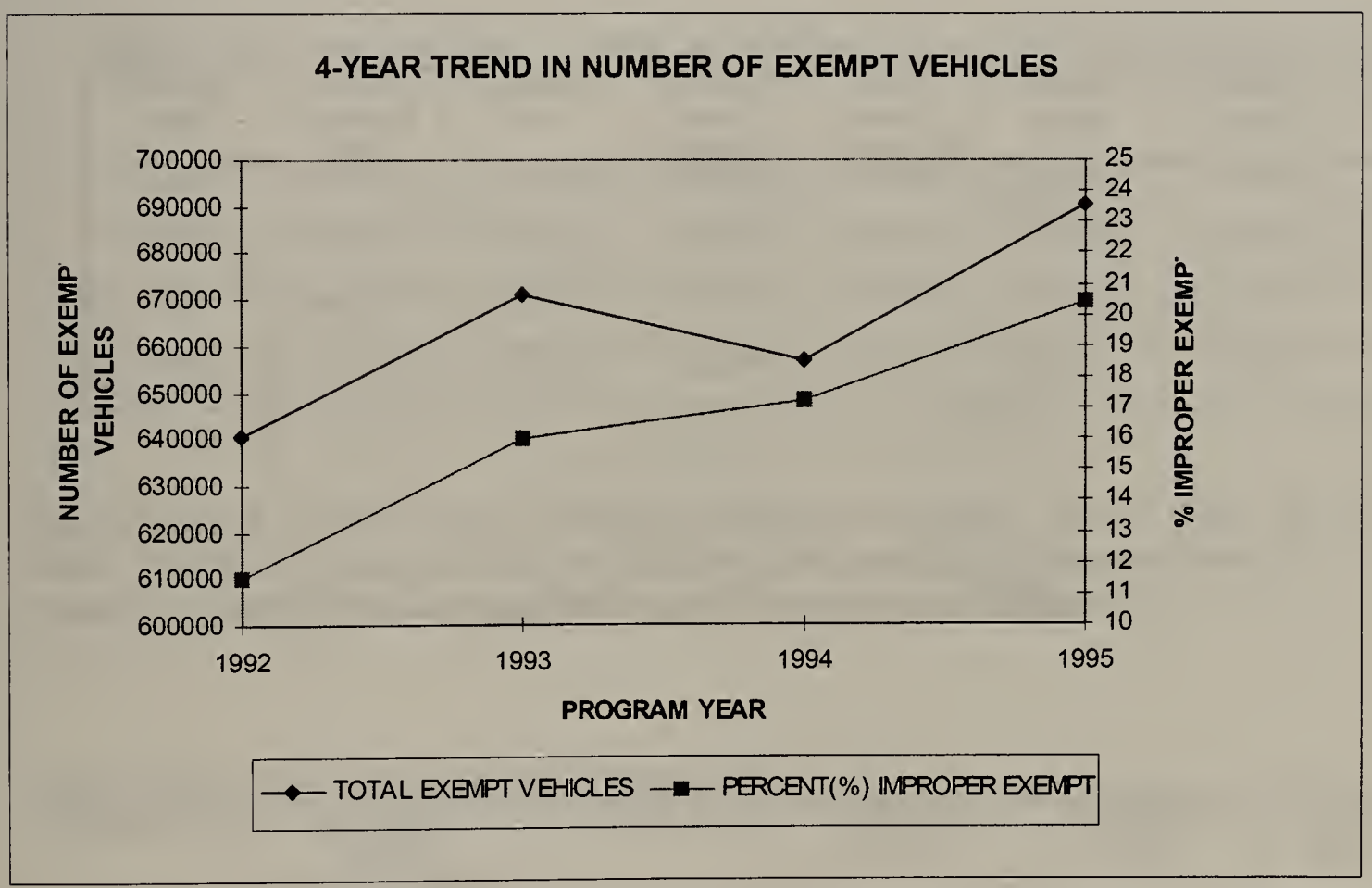
* OTHER includes: motorcycles and HDT

During data analysis, efforts are made towards characterizing the “exempted vehicles," and to assess whether there is a common practice of improperly exempting vehicles that should undergo an emission test from the procedure. The data indicate that, of the initial tests some vehicles are improperly exempted.
Table II-C.3 shows the percentage of improperly exempt vehicles for each year (1992 to 1995).

Table II-C.3: Percentage of improperly exempt vehicles

PROGRAM YEAR	TOTAL NUMBER OF EXEMT VEHICLES	% IMPROPERLY EXEMPT VEHICLES
1992	640,476	11.5
1993	671,099	16.0
1994	656,814	17.2
1995	690,547	20.4

Figure II-C.1 presents the 4-year trend (1992 to 1995) in total number of exempt vehicles.



Further assessments of the 4-year trend indicate that, the practice of illegally exempting the vehicles increased in Massachusetts. As the number of total exempt vehicles increased by almost 8% from 1992 to 1995, the number of illegally exempted vehicles increased by almost 77%.

There is a discrepancy between the number of initial inspections and the actual number of vehicles receiving initial inspections. There are several reasons for this phenomenon:

1. There has been a trend of vehicles receiving multiple, consecutive initial inspections.

2. A vehicle may have failed the inspection and was then given minor adjustments in the inspection bay and incorrectly retested as an initial inspection.

3. The "exempt" status is used to inappropriately or unlawfully bypass the emissions inspection.

For the purposes of this report, and to evaluate program effectiveness, the appropriate base figure from which to work is the actual number of vehicles receiving initial emissions' inspections. Table II-C.4 shows the actual number of vehicles receiving initial inspections. This table also presents the total number of registered vehicles statewide, transaction file, number of recorded initial inspections, number of stickers issued, number of rejected stickers, and the number of waivers for program years' 1992-1995.

Table II-C.4: 1992-1995 BREAKDOWN OF TRANSACTION FILE BY TRANSACTION TYPE

Program year	No. of registered LDV	Transaction file	Recorded initial inspections	Actual initial inspections	Sticker issued	Sticker rejected	No. of waivers
1992	3,817,035	3,710,092	2,752,307	2,193,340	4,325,256	265,202	216
1993	3,894,825	3,589,972	2,676,287	2,498,910	4,118,839	456,000	207
1994	3,981,568	3,273,055	2,420,581	2,263,885	3,756,182	483,400	155
1995	4,092,220	3,205,497	2,343,666	2,195,584	3,741,747	455,800	89

From the total number of recorded initial inspections (tests), 72% in 1992, 79.1% in 1993, 79.6% in 1994, and 80% in 1995 are considered to be passes tests. A breakdown of the initial inspections' tests is presented in Table II-C.5.

Table II-C.5: Breakdown of initial inspections

PROGRAM YEAR	RECORDED INITIAL INSPECTIONS	% PASSES	% EMISSION FAILS	% CO2/RPM FAILS	MULTIPLE INITIAL TESTS
1992	2,752,307	72.0	4.9	2.8	20.3
1993	2,676,287	79.1	9.1	5.1	6.7
1994	2,420,581	79.6	8.7	5.2	6.5

1995	2,343,666	80.0	5.2	8.5	6.3

In Massachusetts between 5-9% of the vehicles tested actually fail the emissions test. Between 3-8% are invalidated tests due to high idle of diluted exhaust. Of this percentage, over 98% pass the free retest after receiving minimal repairs. It is mandatory that any vehicles that fail the I/M test have all necessary repairs completed within 15 days.

Table II-C.6 presents the breakdown of the actual number of vehicles receiving initial emission inspections in term of the number of passes and rejections.

Table II-C.6: Breakdown of the actual number of vehicles receiving emissions inspections

PROGRAM YEAR	INITIAL RECORDED INSPECTIONS	ACTUAL No. OF VEHICLES RECEIVING EMISSIONS INSPECTIONS	NUMBER OF PASSES	NUMBER OF NON-PASSES (Invalid + fail)
1992	2,752,307	2,193,340	1,981,807 (90.4%)	211,533 (9.6%)
1993	2,676,287	2,498,910	2,116,798 (84.7%)	382,112 (15.3%)
1994	2,420,581	2,263,885	1,926,221 (85.1%)	337,664 (14.9%)
1995	2,343,666	2,195,584	1,873,734 (85.3%)	321,850 (14.7%)

The numbers of non-passes include:

- Emissions related failures (i.e., exceedance of the established hydrocarbon (HC), and/or carbon monoxide (CO) cutpoints)

- Invalid tests (i.e., CO2 and RPM for leak and idle check). See Table II-C.8 for breakout

Invalid tests are not considered as failures of the emissions tests. In fact the CO2 leak check and the RPM idle checks are built-in lock-out feature to the analyzers and do not constitute emissions failures. Once engaged the lock-out feature prevents the emissions test from being completed until the CO2 or RPM malfunction is corrected. The numbers of failures do not include the failure of the fuel restrictor or the catalytic converter. Failures in these categories are not treated as either emissions or invalid test failures in the database. They are considered as visual inspections rather than functional tests.

Table II-C.7 presents a breakdown of total actual vehicles receiving initial inspections in 1992-1995 by cutpoint category. The cutpoint categories are established to achieve the I/M program's emission reduction targets, and correlate with the increasing stringency required of emission control equipment installed in vehicles as required by the EPA. The overall initial non-passes rates are further broken down in Table II-C.8. Data on those vehicles that fail the initial emissions test and subsequently pass a retest (presumably after remedial work such as a tune-up) is presented in Table II-C.9.

Table II-C.7: Actual number of vehicles receiving emissions inspections by cutpoint category

PROGRAM YEAR	ACTUAL VEHICLES RECEIVING INITIAL EMISSIONS INSPECTIONS		
	1981+	1980	TOTAL
1992	2,049,150	51,527	2,193,340
1993	2,362,856	47,133	2,498,910
1994	2,196,390	29,847	2,263,885
1995	2,195,584	-	2,195,584

Retest vehicle rates are low. There are a number of reasons why a failed vehicle may not be matched to a follow-up retest:

- Data capture (e.g., incomplete data cassette-to-9-track submittals)
- Data entry errors on the part of the certified inspector (e.g., typographical errors that prevent a plate match during data processing)
- Inappropriate use of the "exempt" status
- Erroneous use of the "initial" versus "retest" status

There is also a population of vehicles that may have, in fact, failed an initial inspection and never received a retest. These vehicles may, in the interim, have been sold, junked, stolen, put into storage, or moved to another state. It is also possible that the owner of the failed vehicle may have secured a certificate of inspection through other means, and not through the typical retest procedure route. All combined, they may artificially inflate the number of initial inspections and skew the true retest pass rate.

Despite apparent concerns regarding the retest vehicle's rate, the consistency across all cutpoint categories is important to note. It should also be noted that, of the retest vehicles, the overall retest failure rate is 12%. There is a trend of vehicles receiving multiple retest. This accounts for the difference between the number of retest vehicles and the sum of retest passes, retest failures, and the number of retest exempt in Table II-C.9 (i.e., in 1992-1995 between 0.3 to 2% of retest vehicles received multiple tests)

D. PUBLIC OUTREACH AND PUBLIC INFORMATION

1. Phone Log/Public Inquiries

One aspect of program operations is public information. In 1992 through 1995, the DEP received numerous telephone calls and written requests from a variety of sources that included businesses, inspection stations, the general public, and local, state, and federal agencies. Inquiries were initiated by requestors for a variety of reasons. The requests ranged from searches for specific information, to queries regarding waiver procedures, to general questions about the program. Table II-D.1 presents a breakdown of the types and number of telephone queries which were logged-in during 1992-1995 period.

A breakdown of the calls logged-in during 1992-1995 by requestor is presented in Table II-D.2. Calls from inspection stations comprised the bulk of the queries. Since the I/M databases are public record, it is part of the Department's responsibility to respond to requests for access to those data. Requests are routed to the Information

Systems Branch at State College. Individual 9-track tapes are mounted and searched. Processing these requests takes several weeks, due in part to the volume of the database that must be searched. DEP competes with other state agencies for computer time. Some requests require the generation of printouts spanning several years of data for a particular station, and others require one transaction listing for a particular station on a particular date. Both types of requests, require the mounting of at least one tape. They also require a search through at least one full month's worth of data for one analyzer (i.e., search for an average minimum of 86,000 records).

2. New Posters and Failure Brochures

The I/M program requires the past 15 vehicle model years be subject to emissions inspections. It also requires that the pass/fail cutpoints are tagged to model year groupings. The DEP annually produces wall posters for licensed inspection stations to display for the public. DEP prints approximately 3000 I/M posters each year. These posters reflect the changing applicable model year.

The DEP also produces approximately 380,000 failure brochures. These brochures identify the most common reasons for vehicle I/M emissions test failures to assist the motorists and mechanics in making decisions on repairs. It is distributed at the inspection stations at the time of an inspection failure. By regulation, failure brochures are required to be distributed in order to properly explain the likely causes and suggested courses of action for any motorist who fails his or her emissions inspection.

Table II-D.1: Number of telephone inquiries

PROGRAM YEAR	TYPE OF INQUIRY	CALLS No.	CALLS %
	PROGRAM DETAILS [a]	123	26
	INSPECTOR RELATED (CERTIFICATION/TRANSFER)	188	40
	EQUIPMENT MAINTANANCE CONTRACT	12	3
	SERVICE STATION COMPLIANCE	11	2
	RECORDS SEARCH (ISB) [b]	59	13

1992	CAAA 1990/ENHANCED I&M	21	5
	ENFORCEMENT	07	2
	OTHER	46	10
	TOTAL INQUIRIES	**467**	**100**
1993	PROGRAM DETAILS	123	28
	INSPECTOR RELATED (CERTIFICATION/TRANSFER)	158	36
	EQUIPMENT MAINTANANCE CONTRACT	11	2
	SERVICE STATION COMPLIANCE	04	1
	RECORDS SEARCH (ISB)	37	9
	CAAA 1990/ENHANCED I&M	51	12
	ENFORCEMENT	07	2
	OTHER	40	10
	TOTAL INQUIRIES	**434**	**100**
1994	PROGRAM DETAILS	92	22
	INSPECTOR RELATED (CERTIFICATION/TRANSFER)	131	31
	EQUIPMENT MAINTANANCE CONTRACT	13	3
	SERVICE STATION COMPLIANCE	-	-
	RECORDS SEARCH (ISB)	12	3
	CAAA 1990/ENHANCED I&M	85	20
	ENFORCEMENT	18	18
	OTHER	73	73
	TOTAL INQUIRIES	**424**	**100**
1995	PROGRAM DETAILS	100	26
	INSPECTOR RELATED (CERTIFICATION/TRANSFER)	190	50
	EQUIPMENT MAINTANANCE CONTRACT	4	1
	SERVICE STATION COMPLIANCE	-	-
	RECORDS SEARCH (ISB)	20	6
	CAAA 1990/ENHANCED I&M	15	4
	ENFORCEMENT	16	4
	OTHER	34	9
	TOTAL INQUIRIES	**379**	**100**

(a) includes issues such as warranties, waivers, imports, consumer protection, engine switching, failures in RPM, catalytic converters and fuel filler necks, and special test procedures

(b): area programs implementation branch within the division of air quality
information system branch within the division of air quality

Table III-D.2: Number of logged in telephone inquiries by requestor

PROGRAM YEAR	REQUESTOR	CALLS No.	CALLS %
1992	GENERAL PUBLIC	149	31.9
	INSPECTION STATIONS/INSPECTORS	185	39.7
	ANALYZER MANUFACTURERS	20	4.3
	REGISTRY OF MOTOR VEHICLES	37	7.9
	AGENCIES (LOCAL, STATE, FEDERAL)	20	4.3
	LEGISLATURE/EXEC. OFFICE	03	0.6
	BUSINESSES & AFFILIATED AGENCIES	45	9.6

	OTHER	08	1.7
	TOTAL	**467**	**100**
	ANALYZER MANUFACTURERS	141	32
	REGISTRY OF MOTOR VEHICLES	170	40
	AGENCIES (LOCAL, STATE, FEDERAL)	25	6
	LEGISLATURE/EXEC. OFFICE	21	5
	BUSINESSES & AFFILIATED AGENCIES	23	5
	OTHER	54	12
1993	**TOTAL**	**434**	**100**
	ANALYZER MANUFACTURERS	136	32
	REGISTRY OF MOTOR VEHICLES	160	38
	AGENCIES (LOCAL, STATE, FEDERAL)	15	3
	LEGISLATURE/EXEC. OFFICE	25	6
	BUSINESSES & AFFILIATED AGENCIES	28	7
1994	OTHER	60	14
	TOTAL	**424**	**100**
	ANALYZER MANUFACTURERS	107	28
	REGISTRY OF MOTOR VEHICLES	205	55
	AGENCIES (LOCAL, STATE, FEDERAL)	9	2
	LEGISLATURE/EXEC. OFFICE	19	5
	BUSINESSES & AFFILIATED AGENCIES	9	2
1995	OTHER	30	8
	TOTAL	**379**	**100**

E. EMISSIONS ANALYZER AUDIT PROGRAM

The Massachusetts Emissions Analyzer Audit Program was introduced on April 1, 1986. Analyzers read the concentrations of specific test gases that simulate the exhaust. The Audit Program is designed to assess and determine the accuracy of these analyzers. The Program also assesses the overall performance of the analyzers in the field.

The Analyzer Audit Program is an integral part of the quality assurance (QA) program. This Audit Program is detailed in the Quality Assurance Plan for the Automobile Emissions Inspection and Maintenance Program (February 1990). The personnel involved in this program are called state auditors. The RMV is responsible for conducting initial audits on all state approved analyzers in use twice per year. The DEP is responsible for reauditing all analyzers that fail the initial audit for gas-related failures (HC and/or CO). The DEP provides technical training to RMV auditors on the use of the audit equipment. The DEP also specifies, and supplies the audit equipment for RMV use.

Six analyzer models are produced by three manufacturers is approved for use in the Massachusetts I/M program:

- **Models that are produced by Automotive Diagnostics**

1. Bear 40-950/951 Automatic Computerized Equipment (ACE) with the 43-210 Massachusetts I/M kit

2. Bear model number 42-910 Massachusetts Gas analyzer

3. Allen, EPA Emission Analyzer Model number 53-500

- **Models produced by Environmental Systems Products, ESP**

4. Hamilton Massachusetts CVIS Unit (P-NHT 201480-2)

5. Hamilton model number HT204550-3

- **Model produced by Sun Electric**

6. Sun I/M ADC System

The 42-910 Massachusetts Gas analyzer contains the same gas analysis system as is used in 40-950/951 ACE. This model does not have the engine diagnostic capabilities of the ACE and is designed for vehicle emission inspection only. The hardware (i.e., data recorder, CRT, keyboards) is all the same. Both models have been approved by the State of California's Bureau of Automotive Repair (BAR) and the U.S. Environmental Protection Agency (EPA).

The ESP model HT 204550-3 is a modified version of the Hamilton Massachusetts CVIS unit P-NHT201 408-2. Modifications were made to the gas sampling system only. The sample system and optical bench are repositioned to increase maintenance accessibility and improve the unit's internal operating temperature. The modifications of P-NHT201 408-2 to HT 204550-3 are based on the HTS, BAR-approved Pennsylvania unit.

All the above six models meet "the prototype testing requirements" of DEP's regulations 310 CMR 7.20 (5). The requirements of DEP's regulations correspond to BAR-80 (i.e., EPA's approved testing specifications).

Massachusetts has approved three suppliers of emission analyzers since the vehicle emissions testing program began in April of 1983. These suppliers are:

- Automotive Diagnostics (i.e., Allen Test-Products Division and Bear Automotive Service Equipment Co.)

- Environmental Systems Products, ESP (i.e., formerly Hamilton Test Systems)

- Sun Electric Corporation (i.e., Snap-On Sun Equipment Service)

This section of the report provides information on audit program for 1992-1995 program years:

- Summary of initial audits results performed by RMV for 1992-1995 program years
- Six year trend in initial audits
- Initial audit results by manufactures
- Initial audit results based on failure type
- Status of cease and desist orders
- Repairs categories for audit failures
- Reaudit results
- Covert audits

1. Summary of Initial Audit Results

Summary results of the initial audits performed by the RMV for 1992-1995 are presented in Table II-E.1:

Table II-E.1: Summary of initial RMV audits (1/1-12/31)

PROGRAM YEAR	INITIAL AUDIT	NUMBER PASS	NUMBER FAIL	FAILURE RATE
1992	1466	1315	151	10.3
1993	541	481	60	11.1
1994	129	95	34	26.4
1995	474	387	85	17.9

An analyzer can fail an audit for one or more reasons:

1. Gas related problems (i.e., problem with gas calibration (HC, CO, or both))

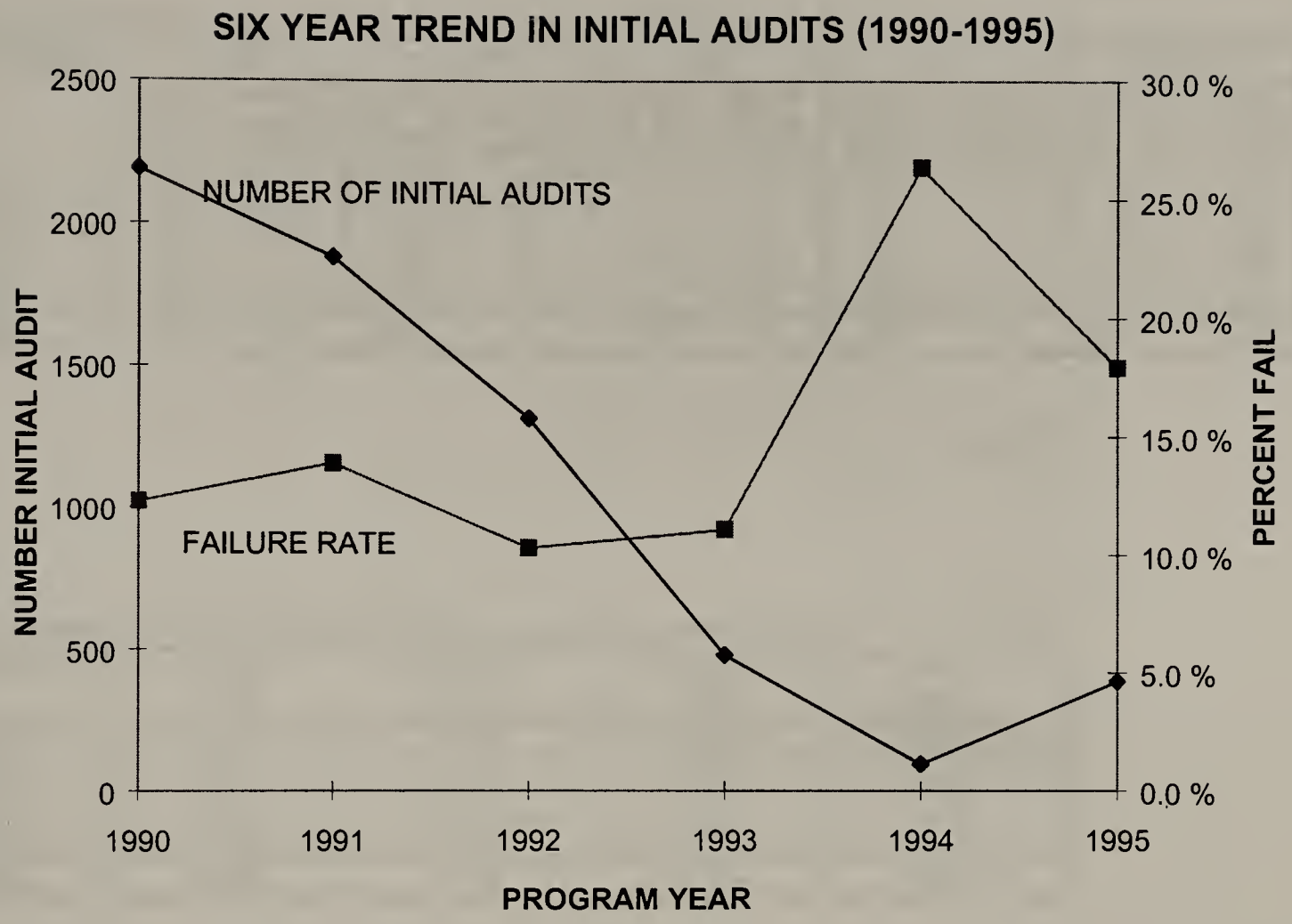
2. Non-gas related problems such as:

   - Faulty probe tip or hose
   - Inaccurate date
   - Leaks in the system (Leakcheck)
   - Printer failure
   - Failures included in the "Other" category indicated on the Analyzer Audit Forms and Cease and Desist Orders:

     a) Calibration failures
     b) Lack of or missing PEF number (Propane Equivalency Factor). PEF is used to calculate the HC and CO emissions during an audit
     c) Incorrect time (i.e., the internal clock in the analyzer needs to be adjusted)

2. Trend in Initial Audit

Six years (1990-1995) trend in initial audits is presented by Figure II.E.1:



The initial audit's trend during 1990-1995 was influenced by the uncertainty associated with the anticipation of replacement of the current program with the new enhanced I/M program.

Number of initial audits decreased by 95% from 1990 to 1994. The failure rate increases dramatically in 1994.

3. Initial Audit Results by Manufactures

A breakdown of initial audits and failure rates by manufacturer is presented in Table II-E.2, and Table II-E.3:

Table-II.E.2: Breakdown of total initial audit results by manufacturer (1/1-12/31)

ANALYSER Mfr.	1992		1993		1994		1995		TOTAL	
	TOTAL NO. OF AUDITS	NO. OF FAILED AUDITS	TOTAL NO. OF AUDITS	NO. OF FAILED AUDITS	TOTAL NO. OF AUDITS	NO. OF FAILED AUDITS	TOTAL NO. OF AUDITS	NO. OF FAILED AUDITS	TOTAL NO. OF AUDITS	NO. OF FAILED AUDITS
ALLEN	30	2	14	2	5	2	13	4	**62**	**10**
BEAR	270	42	103	19	9	4	64	25	**446**	**90**
ESP	928	92	344	33	83	23	303	37	**1658**	**185**
SUN	238	15	80	6	32	5	94	19	**444**	**45**
TOTAL	**1466**	**151**	**541**	**60**	**129**	**34**	**474**	**85**	**2610**	**330**

Table-II.E.3: Breakdown of initial audit results by manufacturer (1/1-12/31)

ANALYSER Mfr.	% FAIL 1992	%FAIL 1993	%FAIL 1994	%FAIL 1995
ALLEN	6.7%	14.3%	40.0%	30.8%
BEAR	15.6%	18.4%	44.4%	39.1%
ESP	9.9%	9.6%	27.7%	12.2%
SUN	6.3%	7.55%	15.6%	20.2%
TOTAL	**10.3%**	**11.1%**	**26.4%**	**17.9%**

Automotive Diagnostics (i.e., Allen Test-Products Division and Bear Automotive Service Equipment Co.) has the highest failure rate compared to other manufacturers. Sun analyzers show the lowest failure rate except in 1995.

4. Initial Audits Based on Failure Type

Table II-E.4 shows the number of audit failures, broken down by failure type.

Table II-E.4: Number of Failed Initial Audits based on failure type (01/01-12/31)

PROGRAM YEAR	TYPE OF FAILURE	NUMBER OF AUDITS	NUMBER OF INITIAL AUDITS	% OF FAILED AUDITS	% OF INITIAL AUDITS
1992	GAS ONLY	85	1466	56.3	5.8
	NON-GAS ONLY	18		11.9	1.2
	GAS & NON-GAS BOTH	48		31.8	3.3
	OTHER*	-			-
	TOTAL	151		100.0	10.3
1993	GAS ONLY	28	541	46.7	5.2
	NON-GAS ONLY	22		36.7	4.1
	GAS & NON-GAS BOTH	10		16.7	1.8
	OTHER*	-		-	-
	TOTAL	60		100.0	11.1
1994	GAS ONLY	3	129	8.8	2.3
	NON-GAS ONLY	25		73.5	19.4
	GAS & NON-GAS BOTH	5		14.7	3.9
	OTHER*	1		2.9	0.8
	TOTAL	34		100.0	26.4
1995	GAS ONLY	24	474	28.2	5.1
	NON-GAS ONLY	51		60.0	10.7
	GAS & NON-GAS BOTH	7		8.2	1.5
	OTHER*	3		3.5	0.6
	TOTAL	85		100.0	17.9

* Failure information is not indicated on Cease and Desist Order

High percentages of the total number of audit failures were due to gas-related problems in 1992 and 1993. This has been reversed in 1994 and 1995. As the analyzers getting older, they experience many other types of problems that cause audit failure.

The frequency of various failure items for the initial audits, and a breakdown by manufacturer is presented by Table II-E.5.

Table II-E.5: Breakdown of various failures and their frequencies for initial audits performed (total Failures and manufacturer Breakdown)

PROGRAM YEAR	FAIL ITEM	FREQUENCY	FAILURE * RATE(%)	ALLEN	BEAR	ESP	SUN
1992	HC	95	6.5	3	25	56	11
	CO	86	5.9	1	24	53	8
	PROBE TIP	21	1.4	0	12	7	2
	DATE	4	0.3	0	0	4	0
	LEAK	34	2.3	2	9	17	6
	PRINTER	16	1.1	0	3	12	1
	OTHER	-	-	-	-	-	-
	HC	35	6.5	2	11	19	3
	CO	36	6.6	2	8	22	4

1993	PROBE TIP	1	0.2	0	0	0	1
	DATE	3	0.6	0	0	3	0
	LEAK	12	2.2	1	5	4	2
	PRINTER	7	1.3	0	4	3	0
	OTHER	15	2.8	0	5	8	2
1994	HC	7	5.4	1	2	3	1
	CO	8	6.2	1	2	3	2
	PROBE TIP	6	4.7	1	1	3	1
	DATE	6	4.7	0	0	6	0
	LEAK	2	1.6	0	1	1	0
	PRINTER	9	7.0	0	3	6	0
	OTHER	8	6.2	0	2	6	0
1995	HC	26	5.5	3	4	18	1
	CO	27	5.7	3	4	17	3
	PROBE TIP	9	1.9	0	6	1	2
	DATE	5	1.0	0	1	4	0
	LEAK	17	3.6	0	8	5	4
	PRINTER	15	3.2	0	5	10	0
	OTHER	17	3.6	1	7	9	0

* Frequency of failures for each fail item divided by total initial audits

Gas failure rates are about evenly splited between CO and HC. A CO failure most often is a result of the bench being out of calibration, or due to leaks in the system.

In the 1992-1995 period, 63.5% of the total number of audits were performed on ESP analyzers; 19.5% were performed on Automotive Diagnostics (2.4% on Allen and 17.1% on Bear); 17% of total audits were performed on Sun analyzers. Of 2610 audits performed in 1992-1995 period, Automotive Diagnostics (Bear analyzers in particular) have the highest gas failure rate and Sun Electric's has the lowest gas failure rate.

Table II-E.5 also contains data on frequency of non-gas failure items. Leak check failures, are the most frequent non-gas failure item. A leak check failure indicates that calibration gas is leaking from the analyzer's pneumatic system. The pneumatic system is made up of the external plumbing (probe tip and hose) and the internal plumbing (tubing, piping, filters bowl, and pumps). Probe tip/hose failures occur when the rubber tubing becomes brittle over time and the piping develops cracks, or become loose at its connection. These conditions can also result in a leak check failure. If the probe tip becomes crushed or cracked, and if the probe tip hose is leaking, then a leak check failure will occur. The filter bowl, which is either glass or plastic, can crack or have a loose filter. Any of these leaks checks failures that occur during the "Initial Check" of the audit will shut down the analyzer, and prevent the auditor from obtaining any HC or CO values. Most of the leak check failures recorded, however, occurred during the "Recheck" portion of the audit procedure, when a gas item failed.

In the initial audits the dates that are displayed on the analyzer terminal are sometimes incorrect and had to be adjusted. Analyzer printers also fail during ınitial audits, and are either repaired or replaced.

Several failure items are accounted under the "Other" category, they include:

- Printer failure
- Gas calibration failure
- Analyzer down
- Incorrect or lack of PEF number
- RPM pickup/probe
- Out of calibration gas
- Automatic calibration
- Filter bowl
- Failure not indicated
- Incorrect time
- Electrical calibration.

5. Status of Cease and Desist Order

After an analyzer fails an audit, a Cease and Desist Order is issued by the state auditor. The inspection station is informed of the fact that the analyzer cannot be used for inspection purposes until a manufacturer service technician repairs the analyzer. One of the copies of the Cease and Desist Order is returned to the DEP by the state auditor. It is the station owner's responsibility to schedule a service call for the analyzer to be repaired to a condition suitable to conduct inspections. The service technician indicates on the Cease and Desist Order which repairs were performed. The service technician sends a copy of the completed Cease and Desist Order containing this information to the DEP.

After-repair information for Cease and Desist Orders may not have been received for a number of reasons:

- Station owner may not have contacted the service technician regarding the failed analyzer

- Service technician never completed the Order because the station owner misplaced the Order,

- Service technician repaired the analyzer and then either misplaced or did not complete the paperwork

Any missing Cease and Desist Orders hinder the DEP's ability to adequately ascertain whether and what repairs were performed to bring a failed analyzer into compliance.

Table II-E.6 displays the number of failed initial audits and the status of the accompanying Cease and Desist Orders.

Table II-E.6: Status of cease and desist orders received by the DEP broken down by analyzer Mfg.

PROGRAM YEAR	ANALYZER MFG.	NO. OF FAILED INITIAL AUDITS	TOTAL NO. OF C/D ORDERS RECEIVED	NO. OF COMPLETED C/D ORDERS	PERCENT INCOMPLETE
1992	ALLEN	2	2	2	0%
	BEAR	42	40	33	17%
	ESP	92	87	75	145
	SUN	15	13	10	23%
	TOTAL	151	142	120	15%
1993	ALLEN	2	2	**1**	50%
	BEAR	19	17	14	18%
	ESP	33	33	27	18%
	SUN	6	5	3	40%
	TOTAL	**60**	**58**	**36**	**38%**
1994	ALLEN	2	2	1	50%
	BEAR	4	4	3	25%
	ESP	23	23	15	35%
	SUN	5	2	1	50%
	TOTAL	**34**	**33**	**20**	**39%**
1995	ALLEN	4	2	2	0%
	BEAR	25	21	20	5%
	ESP	37	37	6	84%
	SIUN	19	7	6	14%
	TOTAL	**85**	**67**	**34**	**49%**

A complicating factor is a lack of a common language among the analyzer manufacturers to describe repair activities. Some of the repair terms used by the service technicians have some uncertainty in their meaning. This is largely due to the fact the data are generated from a large number of service technicians, each with his own interpretation of the various repair codes. For example, the terms "recaliberate" in most cases refers to the calibration of the bench, but could mean the calibration of other components of the analyzer. In addition, many service technicians perform certain repairs and calibrations, but do not indicate them on the Cease and Desist Orders. When a gas failure occurs, for example, it is standard protocol that examinations of the tubing, hoses, and pumps occur, followed by a leak check test. These types of repairs and diagnostics, however, are not necessarily recorded on the Cease and Desist Orders.

6. Repairs Categories for Audit Failure

Table II-E.7 describes the various types of repairs performed on analyzers failing initial audits.

Table II-E.7: Breakdown of repair categories for initial audit failures

PROGRAM YEAR	TYPE OF REPAIR	FREQUENCY	ALLEN	BEAR	ESP	SUN
	DATE/TIME	6		1	5	

1992	RECALIB RATION	1				1
	ANALYZER DOWN	2		1	1	
	ELECTRICAL CALIBRATION	1		1		
	PROBE TIP/HOSE	21		13	5	3
	FILTER BOWL					
	LEAK CHECK	28	1	7	14	6
	VACUUM SWITCH					
	OTHER	21		8	11	2
1993	DATE/TIME	4			4	
	RECALIBRATION					
	ANALYZER DOWN	1			1	
	ELECTRICAL CALIBRATION					
	PROBE TIP/HOSE	3		1	1	1
	FILTER BOWL					
	LEAK CHECK	12	1	4	5	2
	VACUUM SWITCH					
	OTHER	5		1	4	
1994	DATE/TIME	8			8	
	RECALIBRATION					
	ANALYZER DOWN	1			1	
	ELECTRICAL CALIBRATION	2		1	1	
	PROBE TIP/HOSE	4	1		2	1
	FILTER BOWL					
	LEAK CHECK	2		1	1	
	VACUUM SWITCH					
	OTHER	17		3	12	2
1995	DATE/TIME	3			3	
	RECALIBRATION					
	ANALYZER DOWN					
	ELECTRICAL CALIBRATION	2			2	
	PROBE TIP/HOSE	8		6		2
	FILTER BOWL					
	LEAK CHECK	15		6	6	3
	VACUUM SWITCH					
	OTHER	26	1	10	15	

If an analyzer fails the audit for more than one reason, it will require several types of repairs. Accordingly, more than one repair code should be indicated for that analyzer.

The terms "recaliberate" in most cases refers to the calibration of the bench, but could mean the calibration of other components of the analyzer.

In addition, many service technicians perform certain repairs and calibrations, but do not indicate them on the Cease and Desist Orders.

The DEP's contract with the analyzer manufacturers requires them to respond within 3 days of an analyzer failure for service.

Once the physical repairs are made on the analyzer, the service technician must recaliberate the bench and other electrical and non-electrical components in analyzer.

Table II-E.8 describes the summary results of reaudits that were performed

by DEP for 1992-1995:

Table II-E.8: Summary of reaudits (01/01-12/31)

PROGRAM YEAR	Actual No. REAUDIT	AUDIT TYPE	NO. REAUDIT	NO. PASS
1992	126	1ST REAUDIT	111	96
		2ND REAUDIT	15	15
		3RD REAUDIT		
1993	51	1ST REAUDIT	46	41
		2ND REAUDIT	5	5
		3RD REAUDIT		
1994	8	1ST REAUDIT	6	4
		2ND REAUDIT	2	2
		3RD REAUDIT		
1995	20	1ST REAUDIT	19	18
		2ND REAUDIT	1	1
		3RD REAUDIT		

Reaudits are performed by DEP auditors only when a gas-related failure occurs during an initial audit (i.e., HC and/or CO failures).

III. MANAGEMENT AND OVERSIGHT

A. MANUFACTURER OVERSIGHT

(1) General Oversight

The relationship that exists among three equipment manufacturers and the Commonwealth is governed by several regulations.

- DEP must ensure that inspection stations are treated as fairly as possible by manufacturers. DEP requires a contract between the manufacturer and the inspection station. This contract places a 3-day working day limit on manufacturers to respond to stations for the repair of audit-failed, faulty, or simply broken equipment.

- The DEP sets a penalty schedule and trigger for failure to comply with program requirements

- DEP places certain technical requirements on equipment manufacturers to use in the emission's inspection. These requirements also establish the means by which the DEP and the RMV can exercise their oversight responsibilities.

B. TRAINING

Training on the regulations that affect the service stations and automotive repair shops was offered by DEP through a series of (4) one-day workshops held across Massachusetts in 1992. The DEP staff from air, hazardous waste, solid waste, and water pollution control assisted the inspection stations to maintain compliance with all of the DEP's regulations. Part of the workshop from the Air Quality Control Division was focused on the I/M program. Most of the planning for1992's workshops are done in 1991. No workshops were held in 1993-1995 period.

C. DATA ISSUES

During the 1992-1995 program year, DEP continued to enforce the data reporting requirements. With one exception, the manufacturers submitted the monthly inspection data tapes in the proper format, and within the prescribed deadlines.

In 1991, the DEP was informed by Regency Computer Network (RCN) that it would be no longer providing data processing services on its CYBER system. As of July 1, 1992, all services in a VAX environment.

D. COVERT AUDITS

Two hundred eighteen covert audits were performed in 1990-1992 period. A total of 3,573 overt and covert audits were conducted from 3/92-12/92. From the total number of 304 hearings conducted in 1992, a total of 232 suspensions were issued. There are no available data from RMV that tracks the number of overt or covert audits in 1993-1995. The station enforcement actions for 1992-1995 period are shown in Table III-D.1:

Table III-D.1: Station Enforcement Actions (1992-1995)

PROGRAM YEAR	1992	1993	1994	1995
NO. OF WARNINGS	20	68	101	285
NO. OF HEARINGS	304	278	141	305
NO. OF SUSPENSIONS	232	117	139	120

In 1993, the undercover DEP strike force, conducted 135 cover visits. Only 15 percent of automobile inspections investigated by the DEP during of a 10-month probe conducted a proper auto emission test. The undercover DEP investigators, who work with the interagency Environmental Strike Force, used cars that had been deliberately "modified" to fail the test automatically, including the removal of their catalytic converters.

One-third of the inspectors intentionally altered the test results to pass the cars that could not pass legitimately. Only 15% of the inspectors (21 of 135) noticed that the catalytic converter had been removed from the vehicle and issued it a rejection sticker. Of the total of 135 inspections conducted: 33% passed the car after manipulating the engine or the test; these stations intentionally altered the test results to pass cars that should not have passes; 25% failed the car, but didn't notice the catalytic converter was missing; 15% properly failed the car after noting the missing catalytic converter, and issued a rejection sticker; 14% failed the car after unsuccessfully attempting to make it pass through manipulation; 6% allowed the motorist to leave without issuing a rejection sticker after determining the car would fail; and 6% passed the car as is. There is no data to support that any covert operations were conducted in 1994-1995.